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FLUXING AGENT COMPOSITIONS FOR BRAZING PARTS, ESPECIALLY ON THE BASIS OF ALUMINUM AS BASIC MATERIAL, AS WELL AS THEIR USE

[FLUSSMITTELZUSAMMENSETZUNGEN ZUM HARTLÖTEN VON TEILEN, INSBESONDERE AUF DER BASIS VON ALUMINIUM ALS GRUNDMATERIAL, SOWIE DEREN VERWENDUNG]

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TITLE (54): FLUXING AGENT COMPOSITIONS FOR BRAZING PARTS, ESPECIALLY ON THE BASIS OF ALUMINUM AS BASIC MATERIAL, AS WELL AS THEIR USE

FOREIGN TITLE (54a): FLUSSMITTELZUSAMMENSETZUNGEN ZUM HARTLÖTEN VON TEILEN, INSBESONDERE AUF DER BASIS VON ALUMINIUM ALS GRUNDMATERIAL, SOWIE DEREN VERWENDUNG

[0001] This invention relates to fluxing agent compositions for brazing, especially brazing of parts on the basis of aluminum, or aluminum alloys, as basic material, where the fluxing agent compositions contain a fluxing agent and a solvent.

[0002] When it comes to brazing solder-plated individual parts for heat exchangers, that is to say, especially of coolers, such as they are used in the auto industry, it is currently customary, when using aluminum or aluminum alloys as basic material, to employ special soldering methods, in particular, so-called NOCOLOK® soldering. This is basically described in DE-OS 26 14 872 as a method for connecting aluminum components with an aluminum soldering solution with a melting point below that of the aluminum components, by heating the composed components to a temperature above the melting point of the soldering solution and below the melting point of the components in the presence of a potassium fluoaluminate flux that essentially is free of unconverted KS [potassium fluoaluminate]. This known method is characterized in the

[1] Numbers in the margin indicate pagination in the foreign text.

following manner: the flux and the soldering alloy are applied on the surfaces of at least one of the components as aqueous slurry consisting of finely distributed flux agents and metal powder, the slurry film is dried and the components are soldered by heating in a dry, oxygen-free inert gas atmostphere (possibly after the assembling), whereby the use of the fluxing agent/soldering alloy slurry is so controlled that one uses 40 to 150 g/m^2 and that the ratio between flux and soldering alloy is so chosen that at least 5 g/m^2 of flux will be separated.

[0003] On account of the special material properties of aluminum or of the aluminum alloys, a noncorrosive, nonhygroscopic fluxing agent is necessary in the mentioned soldering method. In the case of NOCOLOK® soldering, one uses a fluxing agent on the basis of potassium fluoaluminate with the sum formula of $K_{(1-3)}AlF_{(4-6)}$. This fluxing agent is present as eutectic, and it melts at a temperature of 562°C to 572°C and removes the aluminum oxide that is always present on the aluminum as such in the form of a surface impurity. As a result, the surface of the aluminum material is for a short time made accessible to further processing steps, such as brazing which, in

technical terminology, is referred to as "activation of the surface."

[0004] The above-mentioned nonhygroscopic fluxing agent wets the surface and - if the solder plating begins to melt at a temperature of 577°C - the solder can freely be drawn into the solder gap by capillary action. In other words, a complete soldering job, ready for finishing, cannot be done without a fluxing agent application commensurate with the solder situation.

[0005] Usually, the mentioned fluxing agent is applied in the following ways, something which, in technical terminology, is referred to as befluxing:

(a) One sprays on as aqueous suspension in a planar manner, followed by blowing out the networks and subsequent drying;

(b) In that an aqueous suspension is brushed on, followed by subsequent drying;

(c) In that the fluxing agent is applied locally by means of a hollow needle as a pasty suspension in various glycols and/or glycolethers, followed by subsequent drying.

[0006] The different variants for applying the fluxing agent are employed in connection with different devices. The variant, labeled (a), is used mostly for the befluxing of heat exchanger networks and during corrugated rib/pipe soldering. The latter is done automatically by means of so-called "spray befluxing devices." The variant labeled (b), is used for the specifically intended befluxing of, for example, plugged condenser partitions. The variant labeled (c) is used for specifically internal befluxing of, for example, heating element bottoms, partitions, and plug-in fork couplings, as well as for the follow-up befluxing of pipe/bottom connections of all heat exchanger types prior to soldering. This is done manually by means of a hollow needle by an expert, using a stocking conveyor device of the soldering furnace and is correspondingly wage-intensive.

[0007] The following problems occur during on-going production in connection with all of the three described variants of fluxing agent application: during the internal befluxing of the pre-assembled partitions, there is the danger that fluxing agent might run into the dryer cartridge area and that the entire function might be endangered. Befluxing the individual parts of the

partitions is not practicable on account of the insufficient adhesion strength of the conventional fluxing agent suspension and the pertinent parts simply cannot be properly handled. In the variant labeled (c), problems occur due to excessive or undefined fluxing agent application upon the bottom thickness or upon the partition/plug-in fork couplings, internal pipe connections, and so forth and so on, which are expressed in the following manner: either soldering points are not adequately defluxed or the fluxing agent excess closes the gap if the jointing gaps do not retain their dimension which means that the tightness of the heat exchanger is only simulated and no soldering has taken place.

[0008] High wage costs furthermore result from a possibly required manual follow-up befluxing. A full-time worker is required for the follow-up befluxing of the pipe/bottom connection by means of flux paste or the above-mentioned fluxing agent or the fluxing agent composition, per shift and furnace line. Besides, in the case of follow-up befluxing, the accessibility is severely restricted in the collector pipe area. That is especially true in case of follow-up befluxing in the area between the condenser and the coolant/air heat exchanger. Furthermore, there are generally contamination problems, especially due to excessive fluxing agent application, particularly during follow-up fluxing, something that causes cleaning expenditures for soldering templates, furnace chains, and furnace muffles, something that could be minimized by economical application, something that is not possible in view of the currently used technology.

[0009] In addition, when one uses the above-mentioned fluxing agent, or also when one uses other fluxing agents, that are customary with the state of the art, such as, for example, in the case of "CAB" (= controlled atmosphere

brazing), one encounters the following problem: the material to be coated is delivered in the form of big, so-called coils, from which only later on a molded part is shaped in the course of a shaping step, which is followed by befluxing with the fluxing agent. Here is the reason for this complicated procedure: the current fluxing agents are lacking adhesive strength on the surface of the aluminum metal that is contaminated with aluminum oxide, which is why the fluxing agent is applied upon the finished molded part only after the shaping step.

[0010] Along with the above-described disadvantage regarding the costs, one must also keep in mind the contamination problems caused by fluxing in terms of environmental protection.

[0011] The described problems are solved according to the invention in that fluxing agent compositions are supplied which contain at least one fluxing agent, one solvent, as well as one bonding agent.

[0012] In this invention, the term "fluxing agent" will mean especially "finished fluxing agents," in other words, fluxing agents which, along with the actual fluxing agent

in the proper sense, also at least contain one additional component. To that extent, the invention-based fluxing agent again can involve compositions.

[0013] The at least one additional component preferably is a metal, more specifically preferred in powdery metal. In an even more preferred manner, the metal is chosen from the group consisting of aluminum and silicon, especially powdery silicon, such as it is contained in the "silflux" fluxing agent (made and sold by Firma Solvay), or Al-brazing solder.

[0014] Here and in the following, the formulation used is "selected from the group consisting of ..." in order to indicate that one can also use mixtures of the particular cited individual constituents.

[0015] Besides, the invention for the solution of the problem supplies a method for making the invention-based fluxing agent composition, in the form of a method for making coated motor parts, especially coated motor parts for automobile construction on the basis of Al and Al alloys, employing the invention-based fluxing agent composition, providing a correspondingly coated molded

part, obtainable by means of the invention-based method for the production of coated motor parts, brazing coating containing the invention-based fluxing agent composition, as well as a hard brazing method for making composite motor parts on the basis of aluminum or aluminum alloys, whereby the method comprises steps where molded parts, coated according to the invention, are connected by means of hard brazing, as well as methods for making of motor parts coated with the invention-based fluxing agent composition, comprising steps where a raw part, such as a sheet metal piece or a coil is coated with the invention-based fluxing agent composition, obtaining a coated raw part, and where a molded part is formed from this coated raw part.

[0016] Preferably, the bonding agent in the fluxing agent composition is selected from the group consisting of chemically and/or physically drying organic polymers. In an even more preferred manner, the mentioned polymers in turn are selected from the group consisting of polyurethanes, artificial resins, phthalates, acrylates, vinyl resins, epoxy resins, nitrocellulose, and polyolefins.

[0017] In the invention-based fluxing agent composition, the bonding agent preferably is present in a dispergated fashion in a polar or nonpolar solvent.

[0018] The fluxing agent in the invention-based fluxing agent composition is preferably a fluxing agent on a base of potassium fluoaluminate, especially on a base of K_mAlF_m with $1 \leq m \leq 3$ and $4 \leq n \leq 6$. The fluxing agent, contained in the invention-based fluxing agent composition, can in particular be, in terms of elementary analysis, a composition with a content of potassium amounting to 20 - 45%, Al amounting to 10 - 25%, and F between 40 and 60%.

[0019] The fluxing agent, which is preferably contained in the invention-based fluxing agent composition, is present as eutectic, preferably as a eutectic with a melting point between 562°C and 572°C. In particular, the fluxing agent, employed in the invention-based fluxing agent composition, is a NOCOLOK® or some other CAB fluxing agent.

[0020] In a preferred embodiment of the invention-based fluxing agent composition (so-called fluxing agent lacquer), the composition, related to the total fluxing agent composition, contains 15 to 50% by weight, preferably

15 to 45% by weight of fluxing agent, 0.1 to 30% by weight, preferably 1 to 25% of bonding agent, in a polar

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or nonpolar solvent or solvent mixture.

[0021] The invention-based fluxing agent composition can preferably be used for the production of coated molded parts, in particular, molded parts that are coated in a firmly handled manner, on a base of aluminum or aluminum alloys. In particular, it can be used in automobile construction.

[0022] When coating, by adapting the recipe of the composition, one can precisely control the layer thickness and thus also the fluxing agent quantity. Here we encounter the advantage to the effect that one can greatly reduce the consumption of fluxing agent.

[0023] In a particularly preferred embodiment, the invention-based fluxing agent composition furthermore contains at least 1% by weight, preferably 1 to 20% by weight, particularly preferably 1 to 10% by weight, of a

thixotroping agent. Thixotroping agents on a base of gelatins and/or peptins are outstandingly suitable.

[0024] The invention-based fluxing agent composition with the thixotroping agent is made preferably by means of a method comprising the following steps: (a) half of the solvent is prepared together with the bonding agent and the thixotroping agent, (b) the fluxing agent is added while stirring, and (c) the rest of the solvent is added in the last step. It proved particularly favorable in terms of production when one complies with the sequence of steps (a), (b), and (c).

[0025] The invention-based fluxing agent composition is used for the production of at least partly coated molded parts on the basis of aluminum or aluminum alloys, whereby one can start with raw parts, such as, for example, sheet metal pieces or coils or also with already finished molded parts.

[0026] The invention-based methods for the production of coated molded parts, in particularly coated molded parts for automobile construction, on a base of aluminum or aluminum alloys, using the invention-based fluxing agent

composition, comprises the following step: a molded part is coated with the above-mentioned invention-based fluxing agent composition. Then, by way of supplementation, one can perform a drying step. It is preferred when, in a further step, the coated molded part thus shaped, is dried at a temperature in the range of 15°C to 70°C, more preferably, 25°C to 70°C.

[0027] The fluxing agent thus generated on the molded part is grip-fast, so that the coated parts can also be easily handled and can be transported without the coating crumbling off. Partitions for collectors of flat-tube condensers can for instance be poured, without any major quantities of coating bursting off.

[0028] In the soldering furnace, the polymeric constituents of the applied bonding agent are decomposed to form low-molecular volatile constituents, and - assuming correct application and layer thickness - after soldering, one can no longer detect any residues. This is presumably due to the following: the compounds formed during the thermal decomposition of the bonding agent bind residual oxygen and thus locally improve the soldering atmosphere.

[0029] The molded part, obtained by means of the above-described method and coated on the basis of the invention, can be differentiated, on the basis of the following described features, from molded parts that were coated on the basis of different methods, for example, by the absence of accumulations (for instance, in the tube/bottom area) in the fluxing agent coating that is obtained in the end. The fluxing agent coating on the coated molded part is more uniform than the kind obtained from other methods. Besides, during soldering, in the internal area, the entire plated solder is activated, the soldering menisci, for example, on the water side, on the plug-in forecoupling of a heating unit, are shaped considerably more solid than when the customary methods are used. In the interior area, when the invention-based method is used, on account of the planar fluxing agent application, one gets a brighter, more uniform surface than from the other customary methods. Besides, when the invention-based method is implemented, the fluxing agent adhesion upon the surface of the aluminum is assured until complete melting; therefore, there are no blind spots due to inadequate adhesion of the fluxing agent layer and there is no resultant visible thickening of the oxide layer. Assuming correct use, the bonding agent pyrolyses practically without any reside; therefore, there

are no carbon residues ("black spots") as when one uses the customary fluxing agent pastes on a glycol base. In contrast to currently customary methods, this is also expressed by a more uniform distribution by the carbon traces over the entire surface, whereas customary methods in that regard result in a nonhomogeneous distribution.

[0030] To that extent, the invention also supplies coated molded parts with an accumulation of free fluxing agent coating that can be obtained by means of the above-mentioned method for the production of coated molded parts, which comprises the following steps: the above-described invention-based fluxing agent composition is applied upon a molded part and is dried in a further step. In a preferred case, the drying is done at a temperature in the range of between 15°C and 70°C, more preferably in the range of 25°C to 70°C.

[0031] The thus coated molded parts on a base of aluminum and/or aluminum alloys, can be used in automobile construction. In a hard brazing process, in particular, in a hard brazing process for making composite molded parts on a base of aluminum or aluminum alloys, as described above, coated molded parts are produced and are bonded by means of

hard brazing. It is preferred when, during this hard brazing method, the bonding is done by means of hard brazing with heating of more than 450°C, preferably more than 560°C. In particular, using the invention-based method, one can obtain coated molded parts and/or one can connect such parts by means of hard brazing, such as

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they are used for engine cooling.

[0032] In an embodiment of the invention-based fluxing agent composition, which is even more preferred for certain practical purposes, in particular, for the direct coating of raw parts, for example, coils or sheet metal pieces, the composition furthermore contains a thixotroping agent, preferably a thixotroping agent on a base of gelatins and/or pectins. Such thixotroping agents on a base of gelatins and/or pectins and/or acrylates and/or polyurethans, in particular include especially those compositions that contain at least 1% by weight, preferably 1 - 20% by weight, in particular 1 - 10% by weight of the thixotroping agent, with the rest of 15 - 50% by weight, preferably 15 - 45% by weight of fluxing agent, as well as 0.1 - 30% by weight, preferably 5 - 25% by weight of

bonding agent, in a polar or nonpolar solvent or solvent mixture.

[0033] According to the invention, one also gets a method for the production of the above-mentioned thixotroping agent containing fluxing agent composition in the preferred invention-based embodiment, which comprises the following steps: (a) half of the solvent is prepared together with the bonding agent and with the thixotroping agent, (b) the fluxing agent is added while stirring, and (c) the rest of the solvent is added in the last step.

[0034] Most preferred is the maintenance of the above-indicated sequence of steps.

[0035] When the above-mentioned components are put together, the fluxing agent and the bonding agent, according to the invention, are so heavily dispergated at a defined dissolver number of rotations of 50 to 900 rpm and with the addition of the thixotroping agent, just so that the resultant coating with the mixture of fluxing agent / bonding agent / thixotroping agent / solvent, after drying, is present on the base coating in the form of open pores, which means that, during the soldering process, the organic

parts, such as bonding agent and thixotroping agent, can be exhaled unhindered via the pores of the coating.

[0036] With the resultant fluxing agent composition, according to a second variant of the method for the production of coated molded parts, in particular coated molded parts for automobile construction, on a base of aluminum and/or aluminum alloys, a fluxing agent containing a layer is applied (a) on at least one part of a raw part, in particular, a raw part on a base of aluminum or aluminum alloys, in a layer thickness that contains the above-mentioned fluxing agent composition with the thixotroping agent, so that the fluxing agent quantity required for hard brazing will thus be supplied and (b) the coated raw part will be shaped into a molded part.

[0037] According to the invention, the above-described thixotroping agent containing flowing agent composition is preferably applied by means of the customary spray technology.

[0038] The above-mentioned method for the production of coated molded parts should particularly be so implemented in step (a) that the layer thickness, related to the dry

layer, will be set to 1 to 20 µm, preferably 5 to 15 µm. It is preferred when the coated raw part after step (a), at standard pressure, is dried at a temperature of less than 220°C. Suitable for drying is especially infrared drying, in particular, with medium wave radiators, whose maximum emission is present during the absorption of the olefins.

[0039] The fluxing agent composition made according to the invention in the embodiment preferably containing thixotroping agent, is preferably employed for the production of at least partly coated coils, in particular, for the production of coils that are coated in a drip-fast and easily handled manner, on a base of aluminum or aluminum alloys, such as they are employed especially in automobile construction. The thixotroping agent contained in the fluxing agent composition, preferably a thixotroping agent on a base of gelatins, pectins, and/or polyurethanes, increases the adhesive strength of the fluxing agent containing layer upon the raw part. The thixotroping agent containing invention-based fluxing agent composition upon the raw parts, after drying, displays the above-described open-pore structure. Here one may assume that, during drying, the thixotroping agent will at least partly exhale through the open pores.

[0040] The resultant coated raw part can furthermore be provided on its coating with a hydrophobically sealing layer. This hydrophobic seal is used first of all for protection during transportation. Besides, it is used during the reshaping process step from the coated raw part to the molded part. The sealing layer is hydrophobic with respect to the subjacent layer and enters into a force-locking bond with it. This makes it possible to remove the seal without involving the subjacent layer.

[0041] In this variant of the invention-based method, the hydrophobic seal is accomplished by a process step, such as, in a preferred manner, sealing by means of physically drying hydrophobic binders, in particular, polymers.

[0042] The seal can be removed during reshaping by physical methods, in particular, by evaporation, by pyrolysis, and/or extraction with a hydrocarbon, in particular, an olefin.

[0043] The fluxing agent layer supplied according to the invention, in conjunction with the process engineering embodiments, that is to say, when one used a thixotroping

agent, but also without the latter, offers the following advantages, in that it is grip-fast, the coated parts are easily handled, and can be readily transported, whereby the layer will not crumble off during transportation.

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[0044] The particularly preferred second embodiment of the invention-based method, that is to say, the method where a fluxing agent layer and a sealing layer are applied directly on a raw part, such as a coil, moreover offers the following advantages: geometrically difficult parts, such as parts that are present in the form of a beaker or that have cavities, can be provided with a fluxing agent layer before reshaping. As a result of the two-layer structure, consisting of sealing layer and fluxing agent containing layer, one can also minimize the wear and tear on the tools. Furthermore, coating with the fluxing agent composition and a slightly purely physically removable sealing layer, means that the organic part, introduced into the soldering furnace, does not exert any influence on the furnace atmosphere and that no crack products will be generated on the metal surface, something that could negatively influence a brazing job.

[0045] In particular, in the case of the reformed multi-chamber tube, an application of the fluxing agent upon the coil or a part thereof already prior to the reshaping offers additional advantages in terms of process safety and the proper dimensions of the tubes. Besides, the direct coating of the raw part, in this particular case, the coil, as a planar application, will be more uniform, more economical, and more efficient (80 - 90%) than will be possible if individual parts are coated only after the reshaping process.

[0046] By the procurement of externally coated raw parts, such as the coils, with constant quality, one can also eliminate the step of applying a fluxing agent layer. The finishing lines can be operated with a considerably reduced periphery and also with considerably reduced costs. The constant, previously mentioned source of contamination of "network befluxing" (the above-mentioned variant (a)), according to the hitherto customary methods, based on the state of the art, can also be eliminated, as can the entire fluxing agent logistic. In addition, the reshaping oil can be used simultaneously as solvent during the particularly preferred removal of the seal with the help of the reshaping oil. The reshaping oil can also be used in a

cyclic pattern by means of distillation. Any still remaining residual fill can then be removed by thermal defatting.

[0047] The invention will be described in greater detail by examples which however are not to be construed in any restrictive manner.

Production Example

[0048] Production of fluxing agent lacquer

- The following were mixed:
  PU - bonding agent 300 ml
- Fully demineralized water: 700 ml
- This mixture was stirred with NOCOLOK-Flux (SOLVAY) 800 g
- Continue the stirring for 30 minutes at a stirring speed of 200 min^{-1}
- Filtration of mixture via special steel screen with a mesh size of 250 µm

[0049] This resulted in 1.8 kg of ready-to-use mixture with the following composition:

Fluxing agent ..... 45% by weight

PU-binder ..... 2.6% by weight

Rest ..... Fully demineralized water

Practical application example

Lacquering parameter:

[0050]

V_{chain} ..... 0.5 to 4 m/min

V_{oscill} ..... circa 30 m/min

Spraying interval ..... 150 to 350 mm

Nozzle opening ..... 0.5 to 1.2 mm

(continued)

Jet form ..... Flat jet, fan, opening angle about 60°

Material pressure ..... 0.5 bar

Atomizer pressure ..... 2.5 bar

Drying temperature ..... 50°C

Results

[0051] Using the settings in practical application example 1 and the coating mass, described under production example 1, we attained a layer weight (dry layer) of 25 g/m^2. The measured layer thickness averaged 15 µm.

Claims

1. Fluxing agent composition containing at least one fluxing agent, one solvent, and one binder.

2. Fluxing agent composition according to claim 1, where the fluxing agent is a fluxing agent that contains additional components.

3. Fluxing agent composition according to claim 2, where the additional component is a metal, preferably a powdery metal.

4. Fluxing agent composition according to claim 2 or 3, where the metal is selected from the group consisting of silicon and/or aluminum.

5. Fluxing agent composition according to one of the above claims, where the binder is a chemically and/or physically drying organic polymer.

6. Fluxing agent composition according to claim 5, where the chemically and/or physically drying organic polymer is selected from the group consisting of polyurethanes,

artificial resins, phthalates, acrylates, vinyl resins, and polyolefins.

7. Fluxing agent composition according to one of the above claims, where the binder is present in a dispergated manner in a polar or nonpolar solvent.

8. Fluxing agent composition according to one of the above claims, where the fluxing agent composition contains 15 to 50% by weight, preferably 15 to 45% by weight of fluxing agent, 0.1 to 30% by weight, preferably 1 to 25% by weight of a binder, in a polar or nonpolar solvent or solvent mixture.

9. Fluxing agent composition according to one of the above claims, where the fluxing agent is a fluxing agent on a base of potassium fluoaluminate, in particular on a base of K_mAlF_n, with $1 \leq m \leq 3$ and $4 \leq n \leq 6$.

10. Fluxing agent composition according to one of the above claims, where the fluxing agent has a composition determined by means of elementary analysis, of 20 to 45% K, 10 to 25% Al, and 40 to 60% of F.

11. Fluxing agent composition according to one of the above claims, where the fluxing agent is present as eutectic, particularly as eutectic with a melting point in the range of 562°C to 572°C.

12. Fluxing agent composition according to one of the above claims, where the fluxing agent is NOCOLOK©.

13. Fluxing agent composition according to one of the above claims, where the fluxing agent composition furthermore contains at least 1% by weight, preferably 1 to 20% by weight, particularly preferably 1 to 10% by weight of a thixotroping agent.

14. Fluxing agent composition according to claim 13, containing a thixotroping agent on a base of gelatins and/or pectins.

15. Method for the production of the fluxing agent composition according to one of claims 13 or 14, comprising the following steps:

(a) half of the solvent is prepared together with the bonding agent and the thixotroping agent,

(b) the fluxing agent is added while stirring and

(c) the rest of the solvent is added in the last step.

16. Method according to claim 15, where the sequence of steps (a), (b), and (c) is maintained.

17. Use of the fluxing agent composition according to one of claims 1 through 14 for the purpose of making coated molded parts on a base of aluminum or aluminum alloys.

18. Use of the fluxing composition according to one of claims 13 or 14 for the production of at least partly coated raw parts, on a base of aluminum or aluminum alloys.

19. Method for the production of coated molded parts, where the method comprises the following step: the fluxing agent composition is applied according to one of claims 1

through 14, preferably according to one of claims 1 through 12, upon a molded part.

20. Method according to claim 19, where the method comprises the further step where drying is done at a temperature of 15°C to 70°C, preferably 25°C to 70°C.

21. Coated molded part, obtainable by means of the method according to claim 19 or 20.

22. Use of the coated molded part according to claim 21, in automobile construction.

23. Hard brazing method for the production of composite molded parts on a base of aluminum or aluminum alloys, where the method comprises the following steps: coated parts, made according to claims 19 or 20, are connected by means of hard brazing.

24. Hard brazing method according to claim 23, where the bonding is done by means of hard brazing while heating to more 450°C, preferably more than 560°C.

25. Method for the production of molded parts coated with the fluxing agent composition according to one of claims 13 or 14, comprising the following steps:

(a) a raw part is coated with the fluxing agent composition according to one of claims 13 or 14,

(b) the coated raw part is shaped into a molded part.

26. Method according to claim 25, where the method is so contolled in step (a), that the thickness of the layer with the fluxing agent composition, related to the dry layer, is set at 1 to 20 µm, preferably 5 to 15 µm.

27. Method according to claim 25 or 26, where the coated raw part after step (a) is dried at standard pressure at a temperature of less than 220°C.

28. Method according to one of claims 25 to 27, where the coated raw part is provided with a hydrophobically sealing layer.

29. Method according to claim 26, where the hydrophobically sealing layer is removed after the raw part fashioning step to produce the molded part.

30. Method according to claim 29, where the hydrophobically sealing layer is removed by evaporation, pyrolysis, and/or

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by extraction with a hydrocarbon, preferably an olefin.

31. Method according to claim 29, where the hydrophobically sealing layer is removed by means of the reshaping oil that is used for raw part shaping.

32. Method according to one of claims 25 through 31, where the raw part is a sheet metal piece and/or a coil, preferably a sheet metal piece and/or a coil on a base of aluminum or aluminum alloys.

33. Hard brazing method for the production of composite molded parts on a base of aluminum or aluminum alloys, where the method involves steps where, according to the method, according to one of claims 25 to 32, molded parts are made and are connected by means of hard brazing.

34. Hard brazing method according to claim 33, where the molded parts are connected by means of hard brazing while heating to more than 450°C, preferably more than 560°C.

35. Hard brazing coating, containing the fluxing agent composition according to one of claims 1 through 14.